



# **Armed Forces College of Medicine AFCM**



# **Diseases of Pleura**

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*Good Morning !!*

*... have a beautiful day*

# INTENDED LEARNING OBJECTIVES (ILO)



**By the end of this lecture the student will be able to:**

1. List causes of serous, fibrinous and serofibrinous pleurisy
2. Enumerate causes of empyema
3. Describe pathology and complications of empyema
4. Define different types of non inflammatory lesions of pleura
5. Determine causes and complications of non inflammatory lesions of pleura
6. Differentiate between the pathological features of benign and malignant mesothelioma
7. Discuss metastatic pleural tumors
8. Describe causes, types and pathology of lung atelectasis

# Inflammation of pleura



## Types:

### 1- Serous, fibrinous and serofibrinous pleurisy

## Causes:

- 1- Direct spread of infection from nearby septic focus as T.B, bronchiectasis, pericarditis, mediastinitis and lung abscess.
- 2- Blood spread as in septicemia.
- 3- Viral infections.
- 4- Uremia.
- 5- Penetrating chest injuries.
- 6- Specific infection as tuberculosis.
- 7- Lung infarction.
- 8- Tumors of pleura.



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## 2- Empyema:

**Definition:** Suppurative inflammation of the pleura (suppurative pleurisy).

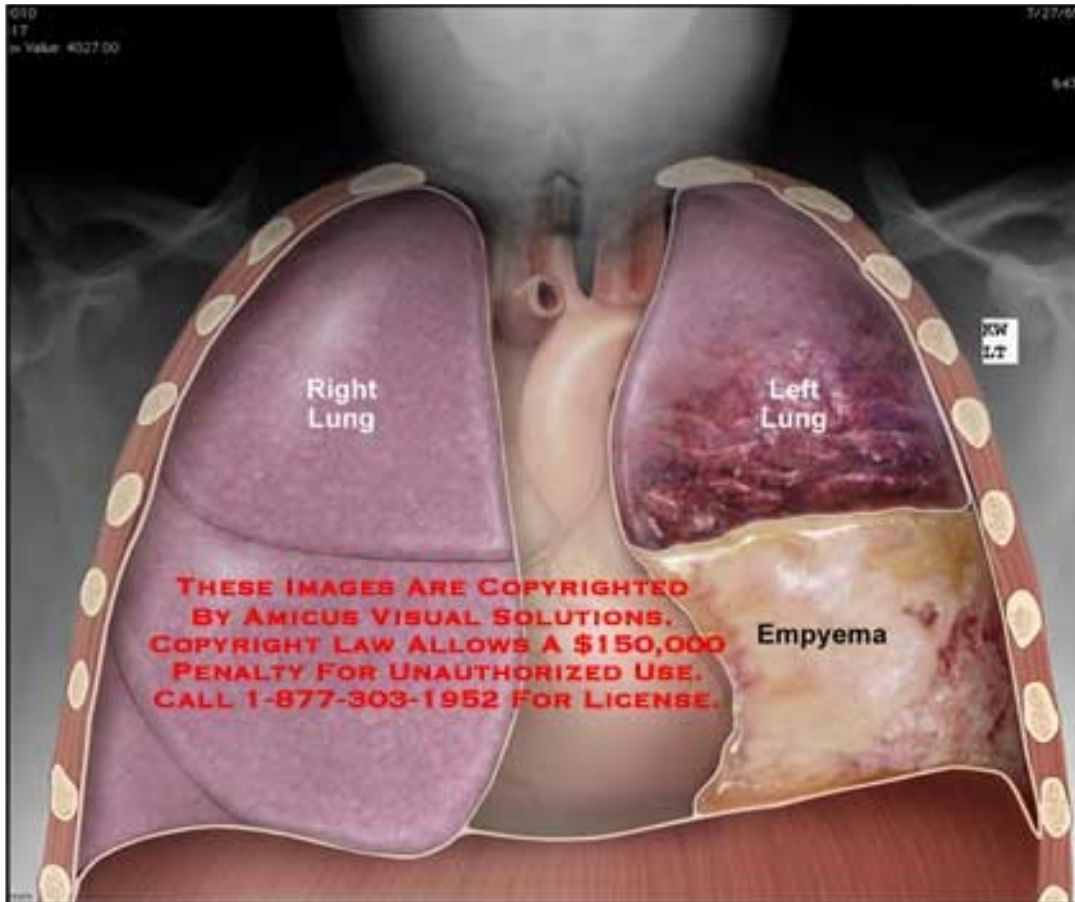
### Causes:

- 1- Mostly from intrapulmonary suppuration by contiguous spread of organisms from lung abscess and other suppurative lung diseases.
- 2- Subdiaphragmatic abscess and liver abscess.
- 3- Hematogenous spread as in septicemia.
- 4- Direct spread from extra-pulmonary infection as osteomyelitis.

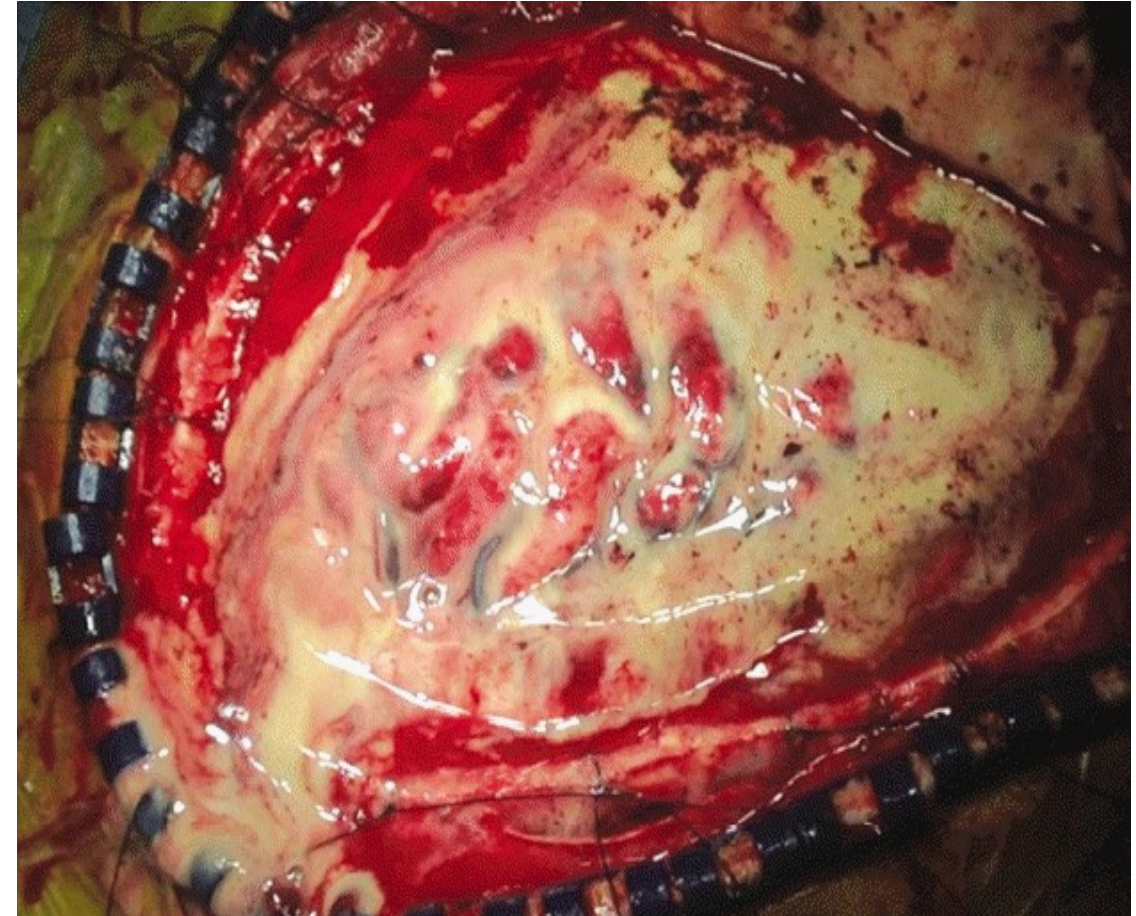
Penetrating chest injuries



# Empyema



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## Pathology:

- Empyema may be **diffuse** affecting the whole pleural cavity or **focal**.
- In the diffuse type, pus accumulates in the pleural cavity causing lung collapse.
- Healing occurs by fibrosis and adhesions and thickening of





## Complications:

- 1- Local spread of infection to the lung, mediastinum and pericardium.
- 2- **Empyema necessitans**: Opening of the empyema by ***sinuses*** through the intercostal spaces on the chest wall (Empyema with bronchopleural fistula).
- 3- Lung collapse in the diffuse type.
- 4- Embolic brain abscess.
- 4- Chest deformity due to dense pleural fibrosis.
- 5- Secondary amyloidosis in chronic empyema.
- 6- Blood spread of infection leading to toxemia, septicemia and pyaemia.

# Non-inflammatory pleural diseases



## 1- Hydrothorax

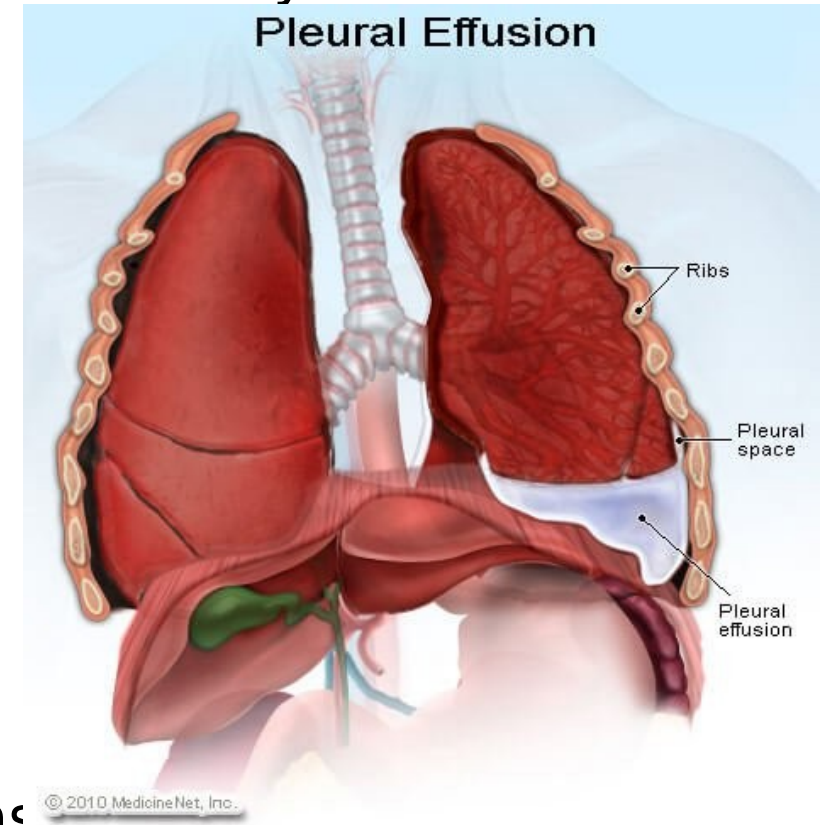
**Definition:** presence of *transudate* in the pleural cavity.

### Causes:

- 1- Congestive heart failure.
- 2- Any other systemic disease associated with generalized edema as nephrotic syndrome and nutritional edema.
- 3- Thrombosis of the azygos vein.

### Effects and complications:

- 1- Compression collapse.
- 2- Secondary infection leads to empyema.
- 3- Healing leads to pleural fibrosis and adhesions.



# Non-inflammatory pleural diseases



## 2- Hemothorax

**Definition:** Presence of blood in the pleural

**Causes:**

**Local causes:**

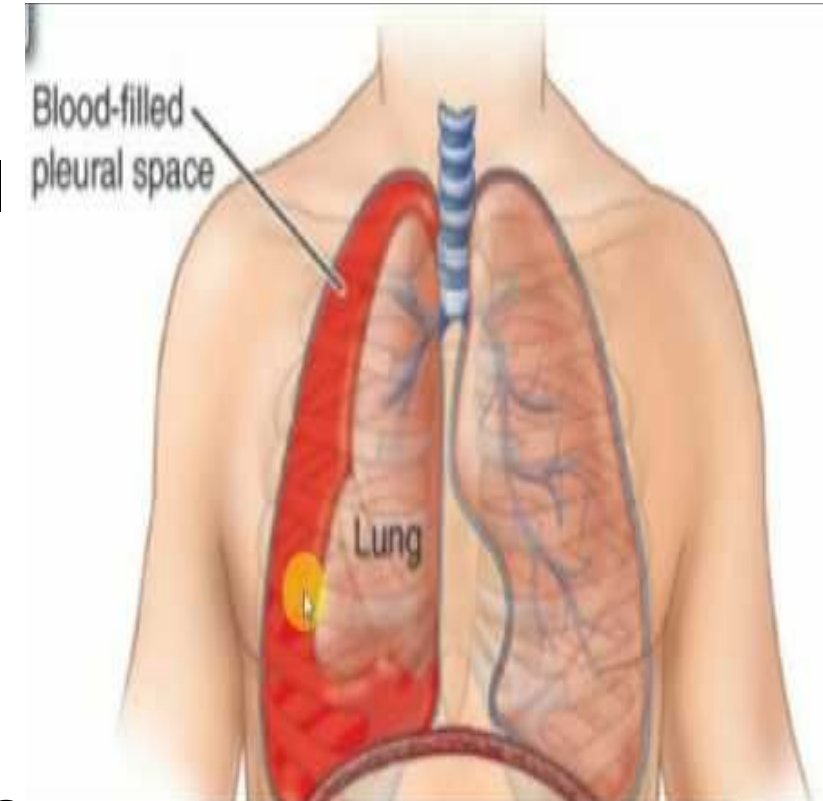
Rupture of aneurysm.

Traumatic [Penetrating injuries].

Malignant tumors

**Systemic causes:** hemorrhagic blood diseases

**Complications:** organization leading to adhesion and lung collapse.



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# Non-inflammatory pleural diseases



## 3- Pneumothorax:

**Definition:** accumulation of air in the pleural cavity.

### **Causes:**

- 1- Spontaneous: due to rupture of emphysematous bullae or tuberculous cavity.
- 2- Traumatic chest wall injuries.



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# Mesothelioma (Primary pleural tumor)



**Definition:** Tumor arising from the mesothelial lining of the pleura or other serous mesothelial membranes.

**Types:**

**Benign: solitary fibrous tumor (localized):**

fibrous tumor attached to pleura.

**Grossly:** firm grayish white localized circumscribed mass.

**Microscopically:** bland, plump, spindle cells with a so-called patternless architecture that surround branching blood vessels.



# Mesothelioma

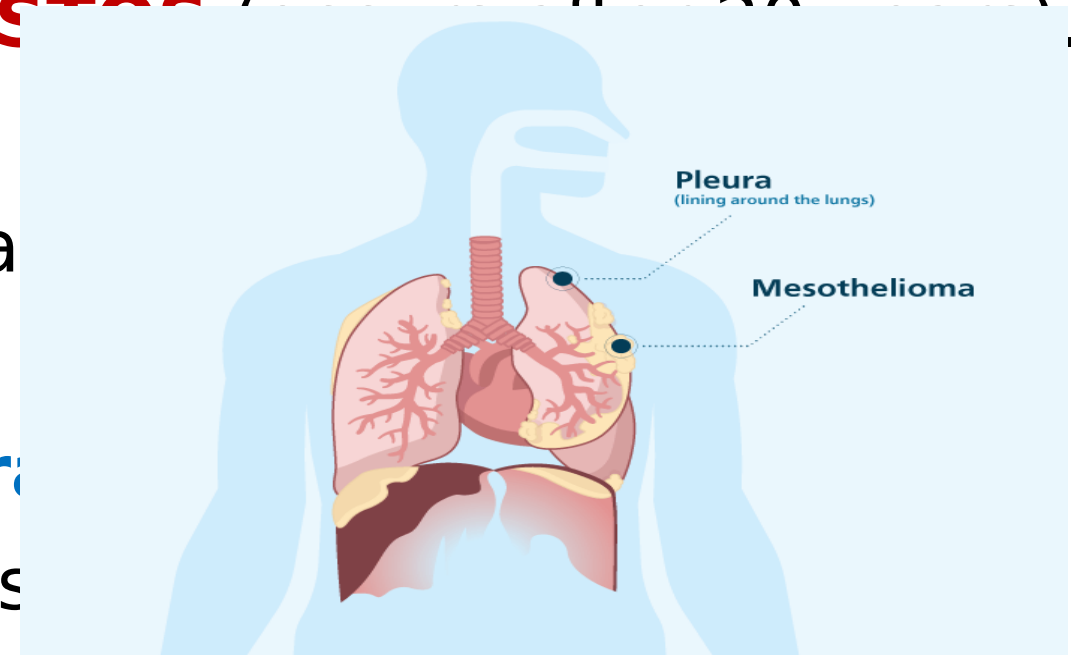


**Malignant Mesothelioma (diffuse):** Arising from the visceral or parietal pleura. The tumor increases with increased exposure to **ASBESTOS** (a mineral fiber).

It is a very aggressive malignant tumor of mesothelial cells of **visceral or parietal pleura**

It has a Very POOR prognosis

Common in Egypt



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# Malignant Mesothelioma



## **Grossly:**

soft gelatinous diffuse grayish pink tumor tissue.

## **Microscopically:**

may be either:

1- Sarcomatoid type formed of spindle shaped sarcomatoid cells.

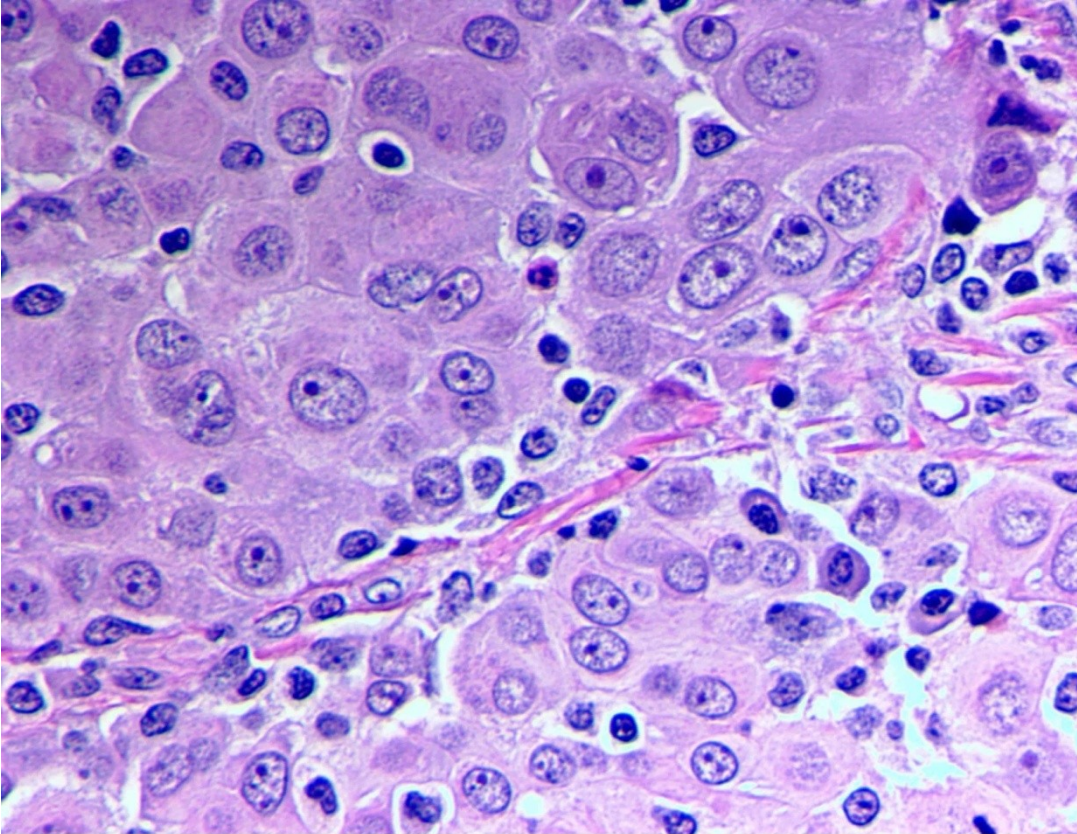
2- Epithelial like (carcinomatous) formed of columnar cells arranged in tubular, acinar or papillary pattern.

3- Biphasic (sarcoma + carcinoma)

## **Immunohistochemistry:**

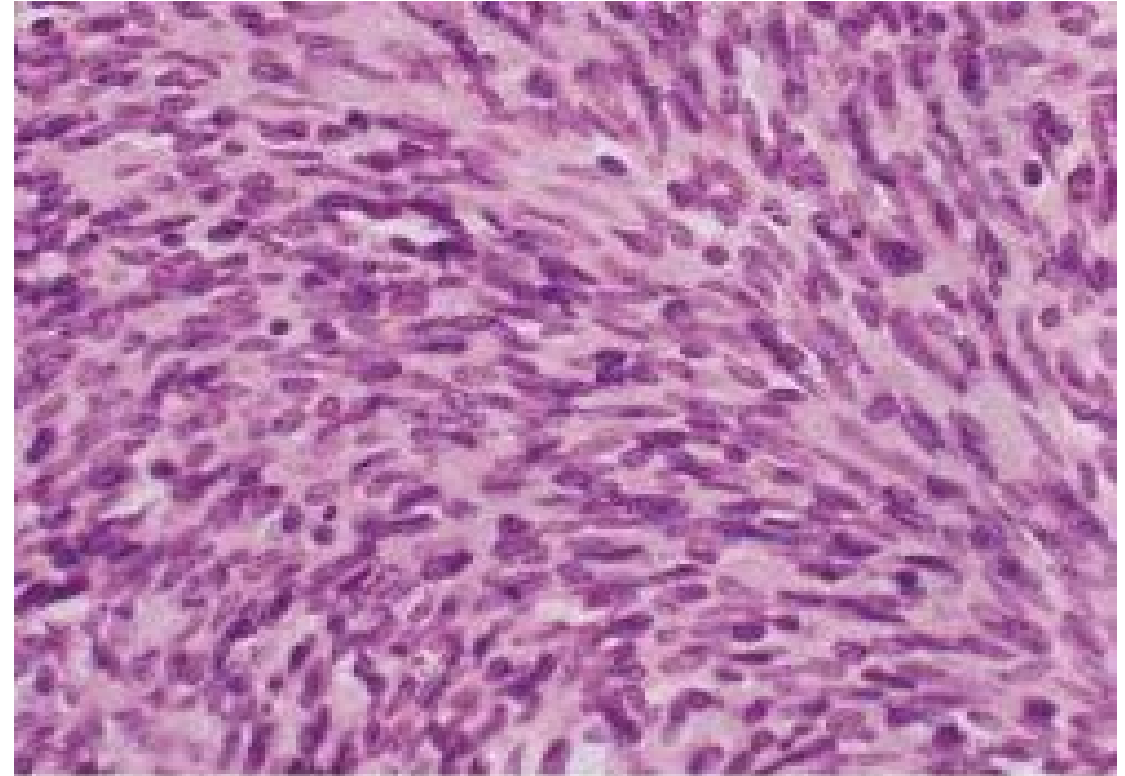
Calretinin, CK5/6 , Vimentin. Negative to TTF1, CK20.

# Malignant Mesothelioma



Epithelioid mesothelioma (pleural): tumor cells have abundant eosinophilic cytoplasm, vesicular nuclei and prominent nucleoli (H&E, 40x)

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## Sarcomatoid Cells

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# Metastatic tumors of pleura (Secondary Pleural Tumors)



## Pleural Metastasis:

**Common** tumors.

Reach the pleura by lymphatics and blood mainly from  
**breast carcinoma** and **bronchogenic carcinoma**

# Pulmonary Atelectasis



**Definition:** either non expansion or incomplete expansion of the alveoli.

## **Causes and types:**

### **1- Neonatal respiratory distress syndrome (*hyaline membrane disease*):**

It is caused by a deficiency of *pulmonary surfactant* which is secreted by type *II pneumocytes*.

It is seen in *premature infants* delivered by cesarean section and in infants borne to diabetic mothers.



# Pulmonary Atelectasis

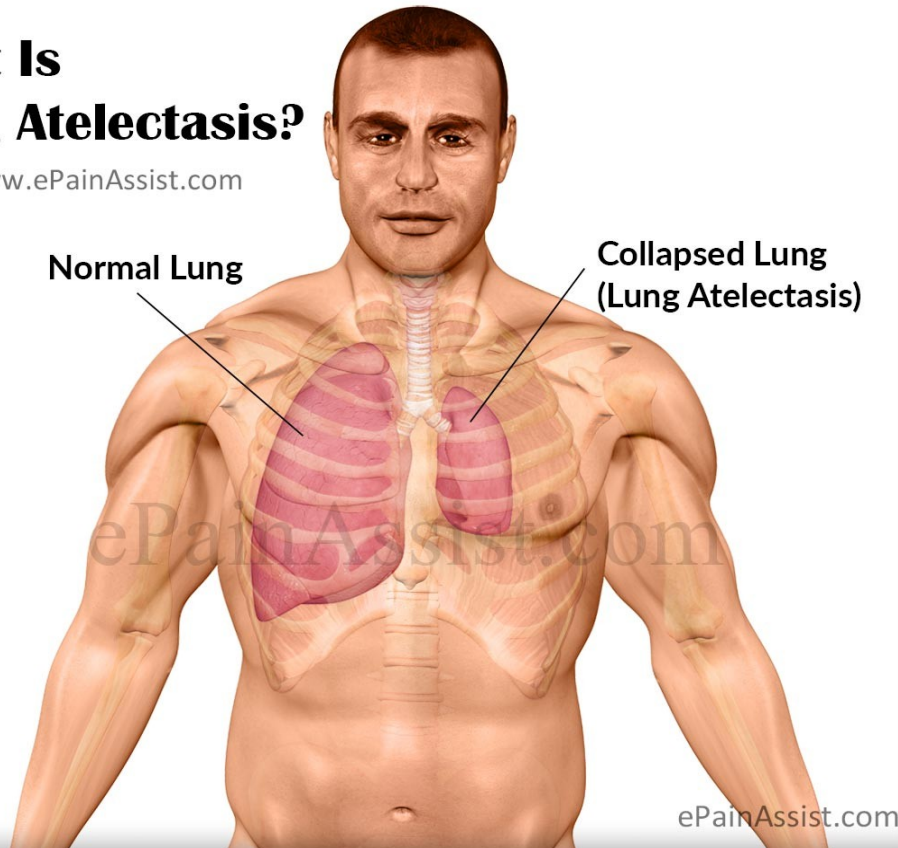


## What Is Lung Atelectasis?

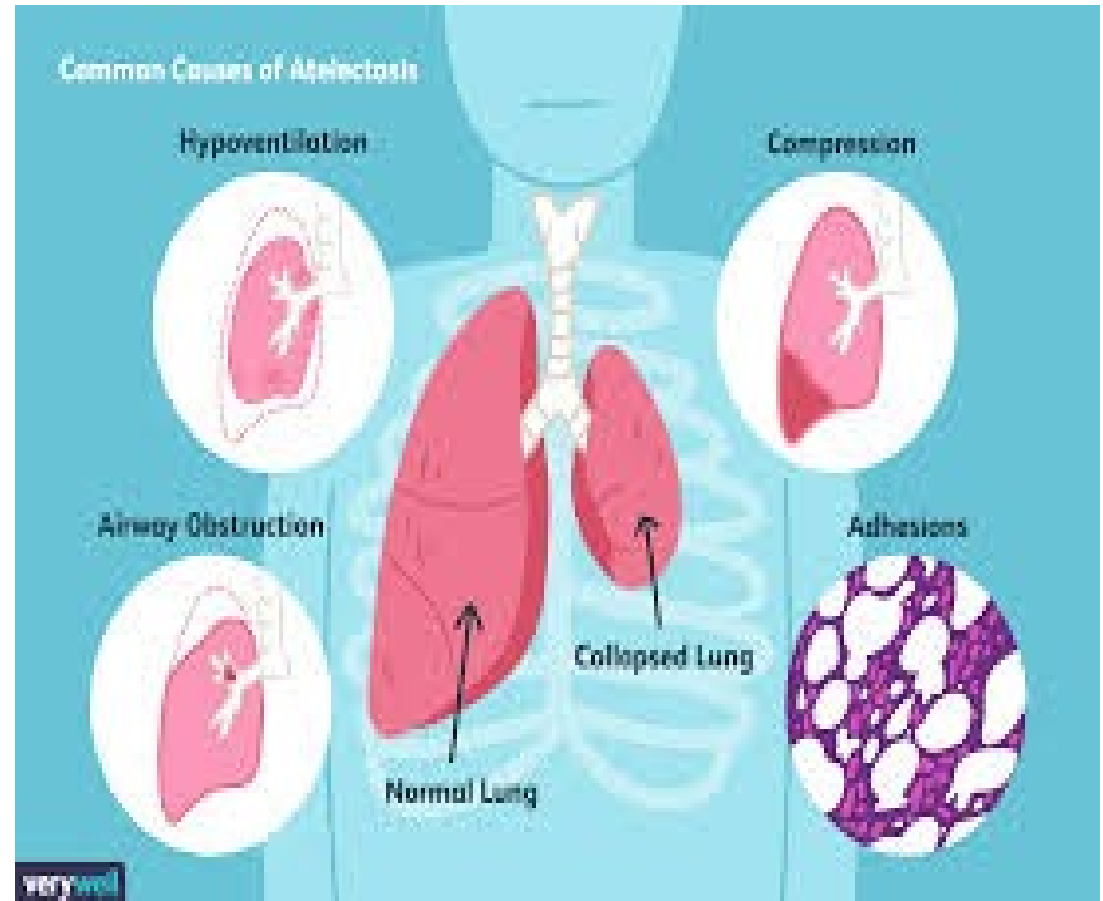
Visit: [www.ePainAssist.com](http://www.ePainAssist.com)

Normal Lung

Collapsed Lung (Lung Atelectasis)



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# Pulmonary Atelectasis



**2- Adult respiratory distress syndrome:** there is diffuse alveolar damage with resultant increase in the alveolar capillary permeability causing leakage of protein-rich fluid in the alveoli and formation of intra-alveolar hyaline membrane.

**3- Compression atelectasis:** in cases of massive pleural effusion, pneumothorax (**complete atelectasis**) and mediastinal tumors (**partial atelectasis**).

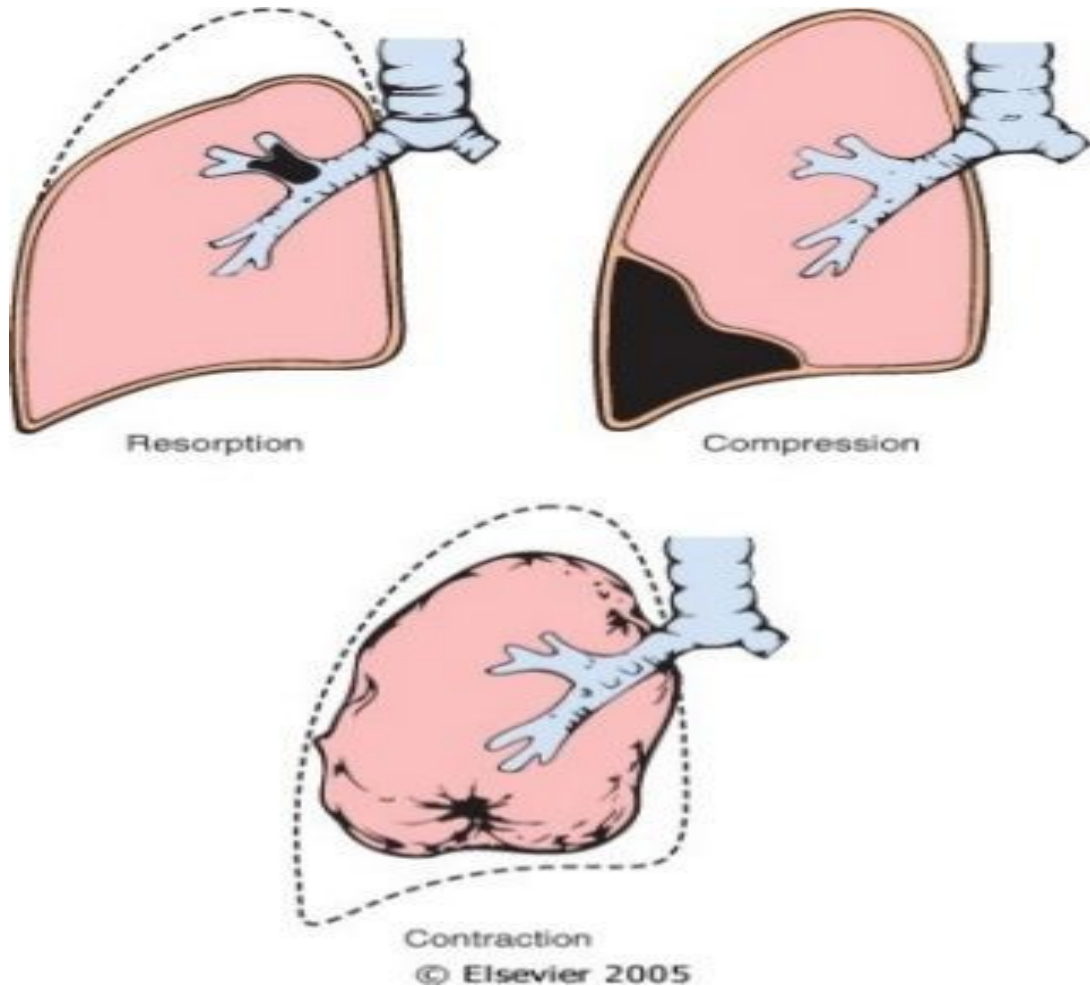
# Pulmonary Atelectasis



**4- Obstructive (Resorption) atelectasis:** secondary to bronchial obstruction by tumor, mucous plug or foreign body.

**5- Contraction atelectasis:** cicatrization atelectasis occurring due to fibrotic changes in the lung or the pleura.

# Pulmonary Atelectasis



## Atelectasis

1. **Resorption atelectasis** = complete obstruction of an airway → *resorption* of the oxygen trapped in the dependent alveoli, without impairment of blood flow through the affected alveolar walls.
2. **Compression atelectasis** results whenever the pleural cavity is partially or completely filled by fluid exudate, tumor, blood, or air.
3. **Contraction atelectasis** occurs when local or generalized fibrotic changes in the lung or pleura prevent full expansion.

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**Accumulation of pus in the pleural cavity is:**

- a- Empyema
- b- Hemothorax
- c- Hydrothorax
- d- Pneumothorax
- e- Pyemia



## Lecture Quiz



- 2- Enumerate the causes of lung atelectasis
- 3- Define empyema necessitans

## SUGGESTED TEXTBOOKS



- 1- Kaplan Medical step 1, lecture notes in Pathology: Chapter 14, Respiratory system , pp. 125-143, 2017.
- 2- Hursh Mohan Text Book of Pathology, 7th ed. (2015): Chapter 14, Respiratory system, pp. 442-488.
- 3- Hursh Mohan Text Book of Pathology, 7th ed. (2015): Chapter 15, eye, ENT and neck, pp. 495-500
- 4- Robbins basic of Pathology, 10th ed. (2018): Chapter 13, Lung. pp. 495-549

